Kansas Department of Health and Environment
Bureau of Waste Management
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SAMPLING ANALYSIS PLAN DEVELOPMENT FOR MUNICIPAL SOLID WASTE LANDFILLS

Technical Guidance Document SW 96-02

Kansas Administrative Regulation 28-29-112(b) requires the owner or operator of a Municipal Solid Waste Landfill to develop and submit to KDHE a Sampling and Analysis Plan (SAP) which details the groundwater sampling and analysis procedures to be used at the facility. Since this document will be used throughout the active and post-closure life of the facility, an adequate SAP is important so that the facility can ensure that monitoring results provide data representative of groundwater quality upgradient and downgradient of the facility. This guidance was developed to assist in the development of this required SAP. The items included in this guidance are considered to be the minimum information required by KDHE. This guidance is based on the Kansas solid waste regulations, the RCRA Ground-Water Monitoring Technical Enforcement Guidance Document (TEGD), and standard practices developed in other states and industry.

GENERAL FACILITY INFORMATION

An essential part of the SAP is a summary of the groundwater monitoring system. The number of monitoring wells, when they were installed, and the relationship between the monitoring well locations and the landfill cell(s) should be noted. A discussion of the characteristics of the uppermost aquifer is necessary, including the aquifer rate of recharge and flow direction.

A table should be included summarizing information for all monitoring wells in the groundwater such as top of casing elevation (MSL), approximate depth to water, installed depth, position (upgradient/downgradient), casing diameter, screen interval, and geologic formation being monitored. Well logs for each monitoring well in the system should be included in the appendices.

A site location map that shows the MSWLF location in reference to the nearest city and how to get to the facility is necessary. A second map should also be included which identifies facility property lines, landfill cell boundaries, monitoring well locations, on-site buildings, and other pertinent facility features.

The SAP should include a description of how often groundwater samples will be collected and analyzed (i.e., quarterly groundwater monitoring for the first year, then semi-annually). The SAP should also identify the months in which sampling will take place, as well as list the parameters to be sampled (Appendix I or II) during each event.

DOCUMENTATION

Proper field documentation of each sampling event is vital to the success of the groundwater monitoring program. The SAP should include provisions to properly record all applicable information while performing the field activities. Information can be recorded in a field logbook or on data sheets prepared prior to the sampling event. If data sheets are to be used, the SAP should include an example.

General site information such as weather conditions (air temperature, wind direction, precipitation), date of activity, and a list of the field team members should be recorded in the field notes.

For each monitoring well sampled, recorded measurements, along with the time of measurement, of static water level, total depth, and thickness of immiscible layers (if present) is necessary. Time of well purging, method of evacuation, purge rate, purge

volume, and screening results of the purge parameters should also be recorded in the field notes, as should the sample time, sample collector, order of sample collection, and sample method. Any observations such as unusual monitoring well recharge rates, deficiencies found during the well inspection, equipment malfunction(s), and/or possible sample contamination sources need to be recorded if observed. The SAP needs to include procedures for the documentation of all of these field measurements and observations.

FIELD PROCEDURES

The SAP should contain a list of all equipment, dedicated and non-dedicated, necessary to collect samples from the monitoring wells. If possible, name brands and model numbers need to be provided. For example, "A Soiltest Model PR-760A Water Level Indicator," is preferred over "a static water level indicator." The owner's manual for any equipment which must be calibrated in the field should be included as an appendix to the SAP.

The sampling team should inspect the well and note the condition of the well pad, casing, protective casing, elevation reference mark, and security locks. Any deficiencies should be recorded in the field logbook.

The SAP should include provisions for calibrating any equipment needing calibration. Calibration procedures must be performed according to manufacturer's specifications for all mechanical equipment and measuring devices.

It is necessary to record several measurements prior to the purging and sampling of a well. Static water level and total depth of the monitoring well should be measured to a permanent reference point at the top of the well casing. These measurements should be made to the nearest .01 foot. If any immiscible layer is present, its thickness should also be measured to the nearest .01 foot. Static water level measurements must be completed at all wells prior to the purging of any monitoring well.

Purging Procedure

Stagnant water must be evacuated from a monitoring well prior to sample collection so that a representative sample may be obtained from the aquifer. An adequate SAP includes the equipment and procedures used to purge each monitoring well.

Wells need to be purged in order from least contaminated to most contaminated, based on previous laboratory analyses, to minimize the risk of cross contamination of equipment. Water should be purged from a monitoring well at a rate slower than the well recharges.

The minimum amount of water to be purged is three borehole volumes. A borehole volume is the water present in the well casing plus the water present in the pore space of the gravel pack surrounding the well casing. The SAP should contain the formula used for calculating borehole volume. It is also necessary to note how the evacuated water will be disposed. In addition to the minimum three borehole volumes, water must be purged until the temperature, pH, and conductivity of the purge water have stabilized. These three purge parameters should be analyzed at a frequency no greater than once per borehole volume. Consecutive readings of the three purge parameters within 10% of each other are an indication that the water is representative of the aquifer. Circumstances may exist where evacuating a minimum of three borehole volumes from a monitoring well is not practical. Examples are an aquifer with an extremely slow recharge rate, or a monitoring system utilizing a low-flow purging method. The SAP should note these special conditions.

Sampling Procedures

Samples should be collected from a monitoring well within 24 hours of measuring the static water level and within 2 hours of purging the well. If samples are not collected within 2 hours of purging, an explanation must be included (low-yield wells, slow recovering wells, etc.) As with the measurement recording and the purge procedures, samples should

be collected in order from the least contaminated monitoring well to the most contaminated, based on prior analyses.

The SAP needs to identify the equipment and procedures used at each well to obtain a representative groundwater sample. If water is collected from the discharge line of a pump, the maximum flow rate should be 100 ml/min to avoid agitation and loss of volatile organic compounds (VOCs). Samples for different analytes must be collected in the proper order as specified in the TEGD (VOCs, chlorinated hydrocarbons, polynuclear aromatic hydrocarbons, pesticides, herbicides, total metals, and geochemicals). By Kansas regulations, field filtering is not allowed.

A table should be included in the SAP listing the containers used for sample collection, preservation procedures (ice, hydrochloric acid), the parameters to be analyzed, and the analytical method to be used.

Field Quality Control Samples

Collection and preparation of several types of quality control samples are necessary. The SAP should describe the protocol and frequency for preparing trip blanks, blind field duplicates, and decontamination rinsate blanks.

Equipment Decontamination Procedures

Some field equipment may be dedicated to an individual monitoring well. For non-dedicated equipment used at multiple wells, decontamination of the equipment is necessary between use at monitoring wells. The SAP needs to describe the materials and procedures used for decontamination of equipment.

All equipment must be decontaminated by washing with a non-phosphate detergent, followed by a thorough rinse with de-ionized water. After cleaning, the equipment must be wrapped or bagged to prevent contamination while not in use. The SAP needs to contain detailed decontamination procedures for all field equipment. Provisions for the containment and disposal of equipment decontamination rinsate should also be included in the SAP.

Sample Labels and Chain of Custody Procedures

Proper sample labeling and chain of custody are necessary for the tracking of each sample from the time of sample collection to laboratory analysis. An explanation of all procedures necessary to label a sample and ship it to the laboratory is required in the SAP.

Every sample container needs a label which notes the facility name, sample identification (monitoring well) number, date and time of sample collection, and any other data required by the laboratory. To save time in the field, part of the information may be printed on the label prior to sampling.

Once labeled, a sample must be transported to the laboratory for analyses. Proper chain of custody procedures are to be followed and documented. The SAP should include the method of sample transport and an example of the chain of custody form to be used. Chain of custody forms should include the sample identification, date and time of sample collection, sample collector, any preservative used, analyses requested, and provisions for the transfer of sample custody.

LABORATORY ANALYSES

The SAP needs to summarize the laboratory quality assurance/quality control (QA/QC) program. The analytical methods must be noted, as well as the appropriate holding times. It is necessary to discuss the practical quantitation limits for the constituents of concern, which must be at or below the maximum contaminant level (MCL) or Risk-Based Standards for Kansas (RSK). All analyses must be performed by a laboratory certified by KDHE for the analytical methods used.

Owners and operators of MSWLF facilities are responsible for the validation of analytical results from laboratories. Upon receipt of laboratory data, the owner/operator needs to review the laboratory's QA/QC information and determine if the analytical

results are valid. The SAP should include provisions for this review.

DATA INTERPRETATION AND REPORTING

Statistical Results

A statistical analysis of the laboratory data must be performed to determine if a statistically significant increase (SSI) of a constituent has occurred in the monitoring well system. The SAP needs to include the statistical method or methods which will be used, a discussion on what data will be statistically analyzed, and an explanation of the consequences of statistical analyses. The SAP also should name the computer software which will be used to perform the statistical analyses. This software must be GRITS/STAT compatible. Statistical analysis is required if an SSI occurred in any of the monitoring wells for any given constituent during the sampling event. Statistical analysis is also required if a landfill is petitioning to change from assessment monitoring to detection monitoring

Report of Analytical Results

The analytical results of each sampling event must be submitted to KDHE as part of a comprehensive report that summarizes the entire sampling event.

The SAP should explain what information will be presented in these reports. Reports of sampling events must include, but are not limited to, the following:

- purpose of sampling (i.e. detection or assessment);
- a copy of field notes and/or field data sheet;
- a copy of raw laboratory analytical results;
- compilation of the analytical results (text summary and table);
- a laboratory data validation summary;
- rate and direction of groundwater flow, including a potentiometric surface map;
- statistical analysis results including the identification of any statistically significant increase over background values;
- water quality parameters in GRITS/STAT compatible format (on disk);
- any deviations from the SAP during the sampling event and reasons for the change; and
- certification from a qualified groundwater scientist (a licensed geologist or professional engineer who has sufficient training and experience in groundwater hydrology and related fields).

For additional information regarding proper management of solid waste, you may contact the Bureau of Waste Management at (785) 296-1600 or the address at the top of this document, or visit the Bureau's website at www.kdhe.state.ks.us/waste.